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USING COOPERATIVE LEARNING WITH INFORMATICS TOOLS FOR ADVANCED SCIENCE CONCEPT TEACHING

Florentina IOFCIU, Cristina MIRON, Stefan ANTOHE

Faculty of Physics, University of Bucharest, Atomistilor Street, Bucharest, Romania
florentina.iofcu@gmail.com, cmiron_2001@yahoo.com, santohe@solid.fizica.unibuc.ro

Abstract: Every time we are using a gadget or a multimedia product we are supposed to ask about how it works. For most of the people is very hard to understand scientific explanations used in brochures because of advanced science concepts used. So, when they need some explanations they ask science teachers. Nowadays is a real challenge for a teacher to approach advanced science concepts for students. The most appropriate solution can be using constructivism pedagogy approach. Cooperative Learning can be used for science classes with students. The implementation of cooperative learning allows integration of informatics and web 2.0 tools as collaborative environment. In this paper we present some examples of informatics and online tools integrated in CL science classes for a better understanding and approach of advanced science concepts used in everyday life.

Keywords: Constructivism, Cooperative Learning, Informatics Tools, Web 2.0 tools.

I. INTRODUCTION

We are the witness of unprecedented technical development so there is a real challenge to keep the step with all gadgets seen everywhere. It is also a challenge to be up to date with all science conquest as to understand the scientifically principles underlying the function of new devices. For science teachers is a necessity to be informed about new advanced science concepts as to be able to put them forward to their classes. Students also want to know a lot of these subjects but not in the traditional way, they don't want to spend too much time studying. A solution for their teachers is to change the way of teaching as to be closer from students' demands. For today generation, cooperative learning combined with informatics tools can be a good solution to approach advanced science concepts. Working in groups, socialising and be part of a team is a must for our students and if it is combined with computers or informatics tools to be used connected with computers, the success may be guaranteed.

II. COOPERATIVE LEARNING

Cooperative learning is deep seated connected with group techniques for teaching elaborated by Johnson and Johnson. We may say that cooperative learning is a didactic strategy as well a way of learning or a field of study or research. It is based on constructivist principle connected to students' engagement for their own knowledge. There are five elements of cooperative learning: individual accountability, positive interdependence, face-to-face promotive interaction, group processing and small group skills. The group is very important, the fact that every student belong to a group, and have the feeling that the group can't work without one of the members. The teacher is the one responsible for the decision of group making. There are a lot of strategies of group forming as all the students have the possibility to interact one to each other.

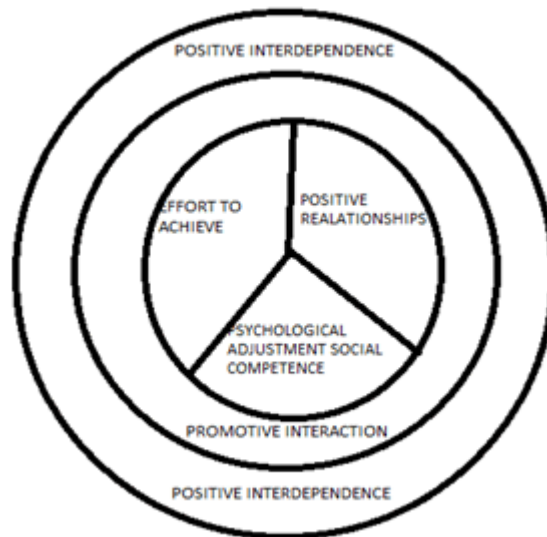


Figure 1. Outcomes of cooperative learning [1]

III. COMPARED ANALYSIS BETWEEN COLLABORATIVE AND TRADITIONAL LEARNING

For a better understanding of cooperative learning peculiarity we proposed to establish the specific differences between traditional and cooperative learning. It is well known that in traditional learning dominant was reproductive learning model, to assume the knowledge exposed by the teacher farthest to understand them. That is the reason it is called explanatory reproductive model [2, p. 184].

Attaining to the conclusion that traditional learning lay emphasis on especially on facts knowing and reproduction going to a less students 'creativity, national curricula demands using of the most efficient pedagogical organising models oriented to student's forming and developing. So it comes in sight the necessity of creating and applying new pedagogical technologies adequate to this vision about education and instruction.

A defined aspect of cooperative learning is effort coordination using reversible messages exchange. Most of researches (D. W. Johnson, R. T. Johnson [3], S. Kagan [4], R. E. Slavin [Apud 5] etc), who referred at cooperative learning concluded that cooperative learning has a great contribution to critical thinking developing compared to reproductive thinking. This is because the continuous interaction between students working in groups for new knowledge achievement. Cooperating in groups, students look for conclusions, formulate ideas, discuss them with others and conclude. During traditional class, students are passive in knowledge achievement and the teacher is the one offering the information contributing to students' reproductive thinking development.

Cooperative learning is a student cantered approach, whereas traditional learning is teacher cantered. During cooperative learning students are actively involved in studying, they participate to group forming, spatial emplacement and new material assuming and also to their own group activity evaluation; the teacher becomes a facilitator and a good organiser. Students' group activity concurs to a long term confine of new knowledge [6].

Cooperative learning develops oral communication skills, which are very important for advanced physics concepts studying. Working in peers or in groups, students are verbalizing their answers while others are actively listening, ask questions and make remarks. Unlike traditional learning, cooperative learning involves many students to talk in the same time, while at traditional classes a student talks and the others are passively listening leaning on the teacher verifying the information. Another side of cooperative learning is the learning process centring and the way of students' interaction in the group. At reverse, traditional learning is based on student's own efforts for evaluations his competences based on results attained, so traditional learning is based on students' learning results. According to many researchers (M. A. Christison [7], G. Gaith [8], G. Jacobs [9],

etc.) cooperative learning goes to students' performances increasing and also to a better classes attending by students. Working in groups students amends the relationships with their teachers because there are creating differed situations, discussing new concepts for knowing each other, working extra classes.

It is well known that each student has his own learning style. Cooperative learning involves using differed learning styles such as kinaesthetic, hearing, visual, while traditional learning laid emphasis on hearing and only occasional to visual learning style.

Using cooperative learning increase the motivation for benchmark and to intrinsic motivation for learning. As well, it develop their critical thinking abilities, new information retention and, of course their interest for the studied concepts. In traditional class prevail students' extrinsic motivation; they are thinking just to attend individual results due to create a competition between students. According to the previous, the main peculiarities of cooperative learning and traditional learning are shown it the following table:

TABLE 1. Compared analysis between collaborative and traditional learning

Cooperative learning	Traditional learning
Contribute to critical thinking development	Contribute to reproductive thinking development
Is student centred	Is teacher centred
Contribute to a long time abstain of new knowledge	Contribute to a short time abstain of new knowledge
Stands on learning process	Stands on product, on what we achieve in the wake of learning
Increases students' learning benchmarks and also their participation at classes	Creates discipline problems during classes, decrease learning focusing
Involves using different learning styles	Involves hearing learning style, sometimes visual one.
Develop intrinsic motivation	Develop extrinsic motivation
Forming social working group abilities	Forming competitive and individualistic abilities.

IV. INFORMATICS TOOLS FOR ADVANCED SCIENCE CONCEPT APPROACH

Magnetism is one of the most mentioned concepts connected with science nowadays. We may refer to magnetorezistence or giant magneotorezistence (GMR) as well as to new magnetic storage devices. For a better understanding of them is important to understand the magnetic domain theory witch is not approached in school curriculum. An informatics tools is agreed by both students and teachers. The advantage of using an informatics tools is the easier way to transmit new concepts, to improve the communication between teacher and students to call the visual learning style needed by most of the students. It is very important to have a good design of the informatics tools, to have a friendly interface as to be accepted by the students. The teacher has to choose carefully the colours, the shapes and also the symmetries and equilibrium. For a good informatics tools the teacher have to design a graphic organiser and make it interactive. In our main interface we beard in mind to highlight the domains of magnetic field arranged as in Figure 2.

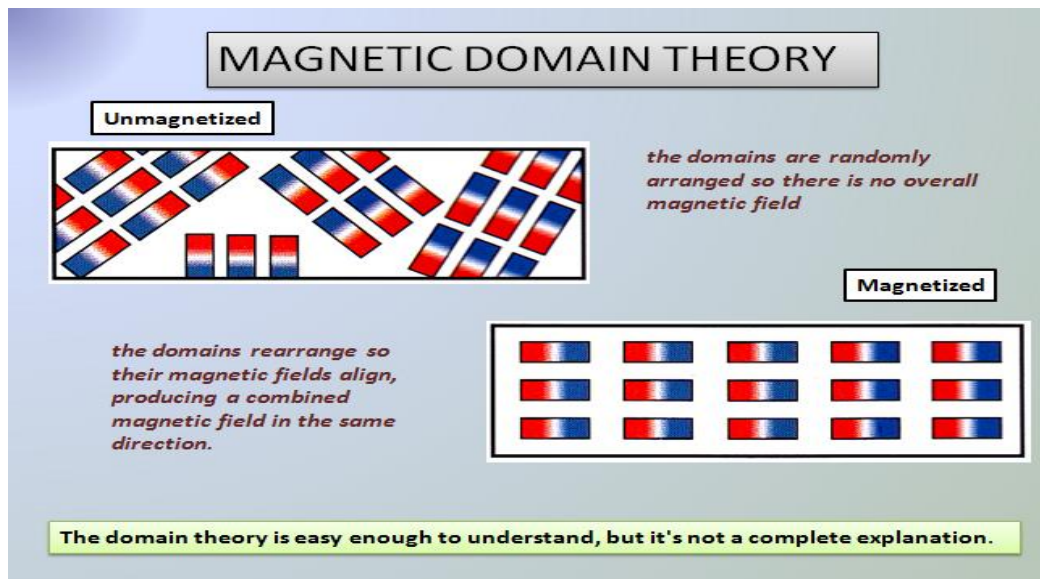


Figure 2. The Magnetic Domain Theory (adapted from [10])

V. USING INFORMATICS TOOL WITH COOPERATIVE LEARNING FOR A BETTER APPROACH OF ADVANCED SCIENCE CONCEPTS

The first step in applying cooperative learning is group forming. The teacher is the one who choose the criteria students are divided in 3-5 group members. It is important that a student interact with all the class during a school year or a semester. Than the teacher distribute the roles for every team member at the beginning of the activity, it is possible that the roles can be changed during the same class. During the activity students are working together as a team in a face to face interdependence, keeping a positive attitude for the study. The teacher observes the team working, answers the questions, leading the activities.

For a better understanding of advanced science concepts the teacher can use an informatics tools previously made. The tool can be accessed during working group activities by the team members or can be posted via internet on a blog as a collaborative environment. Using blogspot.com for important activities or projects involving advanced science projects offers students the possibility to visualize the site any time and how many times they need to. In Figure 3 we pointed the main interface of our blog posted informatics tools.



Figure 3. Blog interface illustrating Magnetic Field Domain

VI. CONCLUSIONS

Cooperative learning is adequate to encourage face to face interactions, to promote socialization, communication and interpersonal relationships. Including a short “computer time” in these activities connected with an informatics tools previously made by the teacher increase the communication, goes to a better understanding of advanced science concepts in a short time, and not at last, students like everything is connected with computers or Hi Tech, or IT.

Connecting the informatics tools with collaborative virtual environment such as blogspot.com, increase the interaction relationships sphere even after the classes task ends.

We have to mention the warning that the teacher has to be an expert in applying cooperative learning for a successfully integrating an informatics tools in class activity.

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